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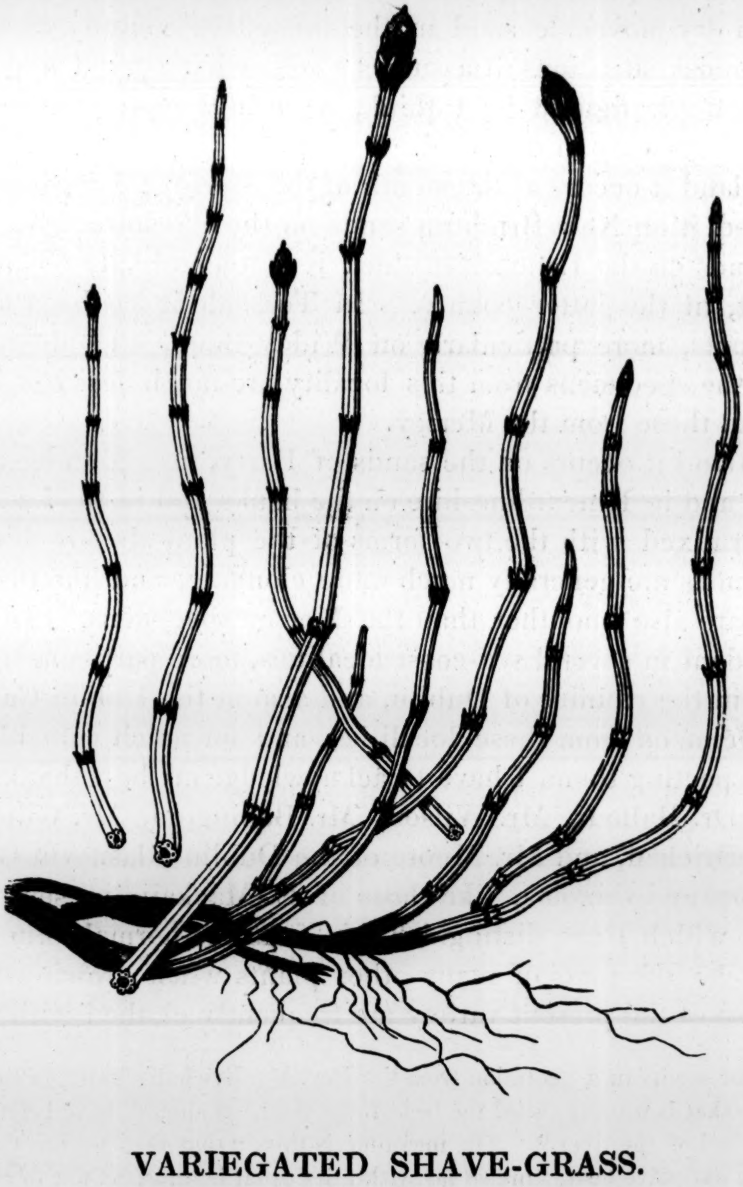
## Art. LXXXVII.—*A History of the British Equiseta.* By Edward Newman. (Continued from p. 308).



VARIEGATED SHAVE-GRASS.

Equisetum hyemale, γ. variegatum.

*Equisetum hyemale*, Linneus, (who gives Bauhin's E. nudum minus variegatum basiliense, as a synonyme), Sp. Plantarum, 1517.
*Equisetum variegatum* (Schleicher's Catalogue) Willdenow, Smith, Hooker, &c.
*Equisetum reptans*, Wahlenberg.
*Equisetum ramosum* var., Decandolle (on the authority of Vaucher).
*Equisetum multiforme*, Vaucher.

THIS, like the preceding form of the species, is local, occurring generally on dry moveable sand in the immediate vicinity of the sea: when in moist situations it assumes a somewhat altered appearance, but the example figured is, I think, a faithful representative of the plant when growing in dry sand.

In England it occurs at the mouth of the Mersey; I have repeatedly observed it on New Brighton sands on the Cheshire side, and the Bootle sands on the Lancashire side: it is tolerably abundant also at Southport, in the latter county. In Teesdale it has been found in several spots, more particularly on Widdy Bank, and about Winch Bridge: the specimens from this locality are much less rough to the touch than those from the Mersey.

In Scotland it occurs on the sands of Barry, near Dundee; also in Rosshire, and in Kincardineshire on the banks and in the bed* of the Dee, intermixed with the two forms of the plant already described; the specimens are generally much more elongate, and like those from Teesdale are also smoother than the Mersey specimens. In Ireland it is abundant in several sea-coast localities, more particularly at Port Marnock in the vicinity of Dublin, and also in the Dublin Canal.

For specimens from these localities, and for much valuable information respecting them, I have to acknowledge my best thanks to Dr. Greville, Dr. Balfour, Mr. Wilson, Mr. Babington, Mr. Gibson, the Rev. Mr. Brichan, and Mr. Moore of the Dublin Glasnevin Garden.

The roots and rhizoma, like those of E. Mackaii, present no characters by which I can distinguish this from the normal form of hyemale. Like the roots of many other plants when growing in loose sand, those of the present variety are frequently clothed with a quantity of matted fibrillæ: the stems are short, often semiprostrate, and the internodes are short and frequently somewhat arcuate, giving the entire stem a sinuous appearance. The figure represents the plant of the natural size; the four detached stems being portions of rather more elongate specimens: both the sheaths and internodes are striated; the striæ are few in number, six or eight may be taken as the average: under a microscope the cuticle precisely resembles that of the varieties already described: the ridges are grooved, the grooves being margined on each side with a longitudinal series of minute flinty tubercles: in the furrows are two longitudinal series of stomata placed very near the ridges, indeed so near, that in stems dried in an immature state, they are frequently partially obscured by the ridges. Mr. Wilson, whose surpassing accuracy deserves the thanks of all botanical students, has pointed out a very decided error in my prior descriptions, in which I have stated the stomata to be placed *on the ridges* instead of *in the furrows*. On receiving Mr. Wilson's note, correcting this error, I carefully re-examined the specimens, and found that my published description was erroneous, and Mr. Wilson perfectly correct. The lower portion of the sheaths is perfectly concolorous with that of the internode, the upper portion only is black, thus causing the sheath to appear much shorter than in the varieties previously described: the teeth are short, wedge-shaped, and commonly without the setiform apex which distinguishes the variety last described: their edges are membranous, occasionally black, as represented in the detached stems to the left of the figure, but usually white, giving the plant that variegated appearance from which its name has probably been derived. The catkin is small, apiculate, terminal and striated, as in the preceding varieties; its scales are few—eighteen to twenty-five in number.

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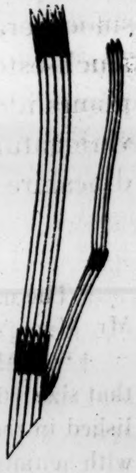
* An error occurs in a quotation from the Rev. Mr. Brichan's letter, (Phytol. 306); instead of "what is usually *called* the bed of the river," it should have been "what is usually the bed of the river." The meaning is this, "that the Dee has this season, owing to the excessive heat, sunk so far within its usual bounds, as not to cover what *is usually* its bed." That part of the Dee in which the Equiseta occur is in the county of Kincardine, not of Aberdeen.

The stem of this variety is much less liable to become branched than either of the preceding, still this branching occasionally occurs; in the margin I have represented a New Brighton specimen bearing a branch; the black colouring of the sheath in this specimen extends much lower than is usual, yet the teeth remain wedge-shaped. Specimens occasionally occur in the same habitat repeatedly branched, and much more luxuriant than the one figured. Of one of these in his own herbarium Mr. Wilson has kindly furnished the following description.



"I have some specimens of E. variegatum from New Brighton, opposite Liverpool, which are very much branched, and very tall; but even in these I can find only two branches at any one joint. I will describe one of the best marked of these. Height 22 inches, of which 2½ inches is black, having been buried in the ground to that depth, and rather more. At 2½ inches two *opposite* branches (A A) shoot out, with *rooted bases*. At the next joint are two other *opposite* branches (B B) placed at right angles to the first pair A $\overset{\text{B}}{\underset{\text{B}}{*}}$ A with respect to the axis. At the next joint are two other opposite branches, as in A A, and at the next joint is another opposite pair, as in B B. The right branch, A, at the seventh joint, has two branches, which are contiguous or nearly so (not opposite), and two more at the ninth in the same condition; two opposite ones at the tenth joint, one branch having the same direction as the two lower branches. In this specimen the main stem is broken off at the height of seven inches; the second primary pair of branches has also one branch ramified, but less remarkably so than the one which I have already given in detail."

Mr. Moore's specimens of the Dublin plant were accompanied by the following note. "There is a third plant* which claims attention. it occurs near Dublin, growing in water, upright, and to a much greater size than E. variegatum in its usual state, and it possesses the other characters noticed in Hooker's 'British Flora,' 4th edition, p. 394,† as distinguishing the plant found by Mr. Wilson at Muckruss. This species or variety, whichever you please to call it, appears to adhere to its natural habit when subjected to cultivation, under which state I have had it about six months, and the new fronds are getting much stronger than those which the plant produced naturally. Although entirely removed from the water it grows quite erect, and continues smoother, with the same number of striæ." I do not agree with my much-esteemed correspondent in thinking the Dublin and Muckruss plants identical, still the Dublin plant is very different from the usual variegatum form, and nearly resembles the specimens from Kincardineshire already alluded to. EDWARD NEWMAN.

(To be continued).

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* The usual forms of Mackaii and variegatum are the other two plants noticed in Mr. Moore's letter.

† "At Mucruss Mr. Wilson finds this plant growing in water and upright to thrice that size [6—8 inches long], with a *stem* smoother, about 10-furrowed and more polished in the furrows, and the *sheaths* not so conspicuously nor so constantly furnished with acuminated *teeth* or summits as is usual in the ordinary state of the plant."—Br. Fl. ed. 4. 394.

## Art. LXXXVIII.—*On the nature of the Byssoid Substance found investing the Roots of Monotropa Hypopitys.* By Thos. G. Rylands, Esq.

Although I feel, and with much more cause, the diffidence experienced by Mr. Newman in expressing an opinion on a subject so difficult as the present one, yet, when after an investigation conducted with the utmost care and deliberation, and extended over many hours, I have arrived at results the most constant and apparently decided, I feel that it is not only desirable, but my duty, to publish them: and moreover, it seems but right, since the matter has proceeded thus far, that it should not be abandoned till some decision be recorded. It is on these grounds that the following remarks are produced to the public.

The opinions already expressed in 'The Phytologist,' relative to the nature of the byssoid substance found on the roots of Monotropa, from all stations that have supplied specimens for examination, are as follows.

Mr. Luxford refers them to a "byssoid fungus," (Phytol. 43); Mr. Lees regards them as "suckers," (Id. 171); Mr. Wilson suggests that they may be "the woolly matted extremities of grasses,"* (Id. 149); and Mr. Newman believes them to be essentially the root, (Id. 297). To these, in the first place, I will add a detail of my own investigations, and then proceed to compare the results of all. Having arrived at the conclusion that the "claviform branches" of the "rhizoma" were the true roots of Monotropa (Id. 329), the minute fibres now under consideration were only examined in connexion with Mr. Lees' idea that they were spongioles or suckers, and then thrown aside: but on the publication of Mr. Newman's observations, to whose kindness I am indebted for specimens of the plant from Shoreham in Kent, and Hurstperpoint in Sussex, without which I should have been ill prepared for my present essay, attention was again directed to them, and the following is the result.

Viewed with a magnifying power of about 30 linear, the byssoid substance presents an appearance not unlike that of unsized paper seen under similar circumstances. It consists of an irregularly matted mass of flocculent matter, more or less depressed, investing the roots of

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* It is but just to my friend Mr. Wilson to state here that after a more careful investigation his opinion is, in the main, in strict accordance with the results of my own observations. Nor would I omit to acknowledge how much confidence the accession of one whose authority is so deservedly high, has imparted to my mind.

Monotropa, and occasionally other substances in its vicinity. Usually it is present in such quantities as to render the examination of it an operation exceedingly difficult; on the Southport specimens it is sometimes much less abundant, but even in these cases it was not till after repeated examination that the real nature of its connexion became satisfactorily apparent. The fibres of which it is composed are nearly equal in thickness throughout, irregularly branched, and united *by lateral adhesion, at intervals,* to the substance on which they are found: this union, in several instances, was so complete, that when the fibres were forcibly detached, a very small portion of the body with which they were connected was separated with them; in no case, however, was this operation performed but a continuation of the fibre became evident, as seen at *n*, *o*, fig. 2. Evidence of a *terminal* connexion or thickened extremities was seen in no instance.*

In order more fully to test the correctness of these observations, the roots of other plants were appealed to: several from the greenhouse which were matted owing to the small size of the pots in which they grew, were examined; but in these a marked distinction was evident, so much so, that at first sight I should have had no doubt of their origin, they possessed in every particular the appearance of spongioles: while the *really* fungoid matter found on the roots of groundsel, Epilobium, Plantago &c., had so much resemblance to the substance in question, that it would be difficult by words to render the difference appreciable.

Thus far had I proceeded when by the application of a magnifying power of about 350 linear, I became aware that the fibres on the Southport plant were of two very different kinds; and, on examination, the specimens received from Mr. Newman afforded, at least, a third. This I regard as a somewhat forcible argument in favour of the opinion that they are altogether extraneous; for all the species are similarly attached, and I apprehend that no such differences as those about to be described would be likely to occur in the roots of one plant.

The species observed are as follows: —

No. I. — Filaments tufted, fasciculate, more or less adnate, membranaceous, slightly tubular, jointed, irregularly branched, colourless.† (Fig. 1, *c*, *d*, *e*).

Found only on Mr. Newman's specimens from Shoreham.

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* These results were obtained with powers of about 100—200 linear.

† The Sussex specimens from Mr. Newman supply a filament differing from these; but as the one had been some time dry before examination, and the others were viewed in a fresh state, I have preferred leaving it undescribed.

Were further proof of a lateral connexion necessary, the fact that the filaments, when not in contact with any other body, are found thus attached to each other, might supply it: in the species most thoroughly adnate they frequently adhere throughout their whole length; (see *d*, *e*, fig. 1).

No. II.—Filaments spreading irregularly, adhering at intervals, horny, smooth, distinctly tubular, and divided by septa, from which are produced the hemispherical buds of the branches? (*g*): branches nearly at a right angle. Of a rich brown colour. (Fig. 2, *f*, *g*, *m*, *n*, *o*; *Fig.* 3, *x*, *y*).

Found in moderate quantities on most of the portions examined, exterior to the other species.

No. III.—Filaments agglutinated or interwoven together, pellucid, with slight traces of a cellular structure, rarely dichotomously branched; accompanied by numerous subspherical tuberculated or granulated bodies (sporidia?), which have on their depressed surfaces a circular lucid disk. (Fig. 2, *h*, *i*, *k*, *l*).

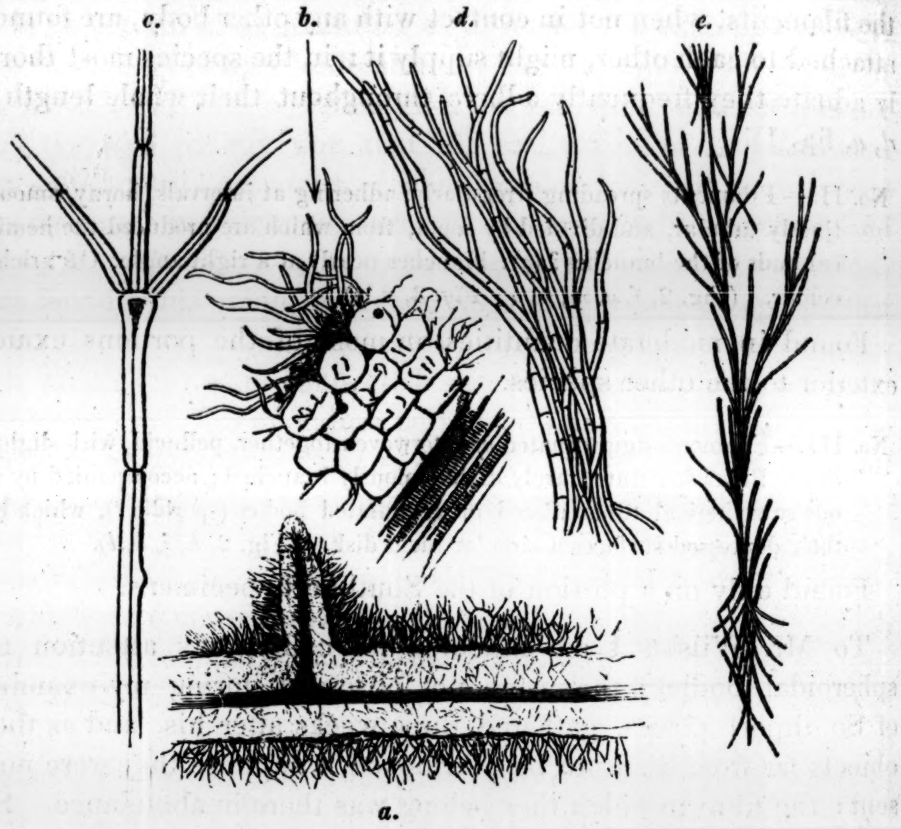
Found only on a portion of the Southport specimens.

To Mr. Wilson I am indebted for calling my attention to the spheroidal bodies; they were not observed during my examination of Southport plants, gathered three weeks after his, and as they are objects far from likely to be overlooked, I suppose they were not present: the fibre to which they belong was there in abundance. Specimens from Southport gathered in 1841, kindly supplied by Mr. Wilson, having the filaments, are likewise without the sporidia.

All my attempts to discover actual proofs of an organic connexion of these globules with the fibres among which they are found, have been unsuccessful: though from several circumstances observed, such as that the filaments are frequently flattened, and have occasionally in the depressions the appearance of scars (fig. 2, *i*), I have little doubt that such does exist, the transparent disks being the point of union. Fragments of one or two other kinds have been met with, but not in quantities to supply the characters for a description. The three given will suffice.

Such are the data on which I would ground the opinion that the "byssoid substance" is really fungoid, and performs no essential function in the economy of the Monotropa. Each of the operations has been often repeated, with all the care and diligence I could command. Sections in all variety have been viewed, wet, moist and dry, with reflected and transmitted light; and though the results were in all cases the same, yet it should be stated that those were the most satisfactory in which the portion had been saturated with, and was examined

FIG. 1.



*a*, A section of the root of Monotropa, showing the internal continuation of the vascular tissue of the spongiole or fibril. *b*. A portion of the same highly magnified, to show the connexion of the flocci.

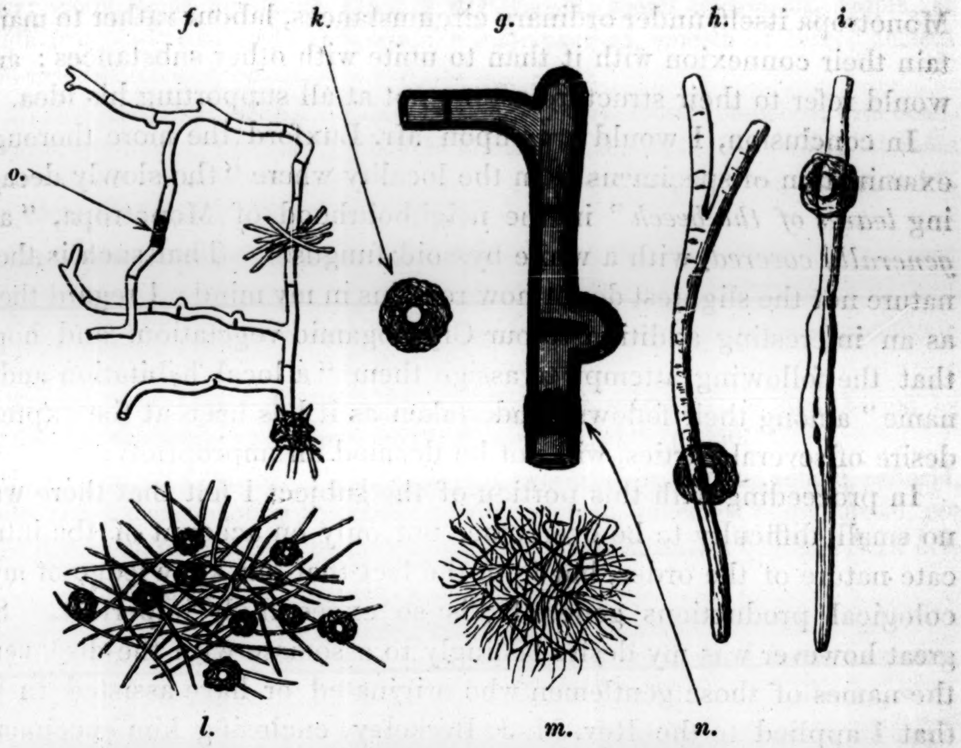
*c*. *Epiphagos Luxfordii*, highly magnified. *d*, *e*. The same, showing its adnate and fasciculate habit.

whilst immersed in, water. From the nature of the objects this might have been expected; for let it be remembered that six thousand of the filaments in juxta-position would but occupy an inch, and moreover, that so delicate and tender is their texture, that the air of a room, or even the dryness ordinary to the atmosphere at this season, causes them speedily to shrivel and contract. The advantages of this mode of examination, and its efficiency, are admitted in regard to other members of the class.

In reply to Mr. Newman's reasons for believing them a portion of the Monotropa, I would say: —

Firstly. — Its presence — if he refers to *a* byssoid substance generally — is, as far as we can judge, scarcely more "constant" than other species of fungus, when the circumstances are suited to their growth; — putrefying paste has *constantly* its Mucor. On some portions of the Southport plant it was not present at all; if the species found on the plant from Shoreham alone is intended, and such

FIG. 2.



*f. Zygodesmus Berkeleyi.* g. A portion of the same, highly magnified. n, o. Supposed to be the adhesive portion; this appearance occasionally continues the whole length of the flocci.

*h, i. Sepedonium Wilsoni*, highly magnified. k. One of the sporidia. l. Portion showing the adnate habit. m. *Sepedonium Wilsoni*, showing *Zygodesmus Berkeleyi* exterior to it.

would appear the most forcible argument, it was not on the Southport plant in any case.

Secondly. — From the examination of analogous productions, I am led to believe that the structural and habitual "uniformity of its growth" is such as to strengthen the idea that they are fungi, rather than to prove them the roots of a phenogamous plant.

Thirdly.—That although, when viewed partially dry, the substance of the rhizoma and these fibres may "*appear* perfectly continuous and identical," yet, when distended, every trace of such appearance is lost; nor does a longitudinal section of the rhizoma display any signs of an internal continuation of the fibres, which, if they were indeed the fibrillæ of the root, might be expected. Such *is* the case with the claviform branches before mentioned, (fig. 1, *a*).

Fourthly.—That in no instance, either sectional or otherwise, could any "rupture of the cuticle" be produced, except such as already explained, and shown on *f* in fig. 2.

In reference to Mr. Lees' opinion that the fibres are "suckers," I would remark, that those portions which are produced on the root of Monotropa itself, under ordinary circumstances, labour rather to maintain their connexion with it than to unite with other substances: and would refer to their structure as one not at all supporting his idea.

In conclusion, I would urge upon Mr. Luxford the more thorough examination of specimens from the locality where "the slowly decaying *leaves of the beech*" in the neighbourhood of Monotropa, "are *generally covered* with a white byssoid fungus." That such is their nature not the slightest doubt now remains in my mind; I regard them as an interesting addition to our Cryptogamic vegetation, and hope that the following attempt to assign them "a local habitation and a name" among their fellows, undertaken as it has been at the express desire of several parties, will not be deemed an impropriety.

In proceeding with this portion of the subject I felt that there was no small difficulty to be overcome, not only on account of the intricate nature of the order, but from the fact that our knowledge of mycological productions generally, is so exceedingly imperfect. So great however was my desire lastingly to associate with the discovery the names of those gentlemen who originated or have assisted in it, that I applied to the Rev. M. J. Berkeley, enclosing him specimens and sketches. To his kind attention and assistance I am indebted for a knowledge of the genera Zygodesmus and Tuburcinia, and several other particulars, without which I could not have approximated so nearly to the truth.

EPIPHAGOS *Luxfordii*, (Ryl. MSS.) Fig. 1, *c*, *d*, *e*.

This I have applied as a provisional name to No. 1 — the species observed by Mr. Luxford on beech-leaves and Monotropa. There is much reason to believe it an undescribed genus, probably a byssoid Alga; but owing to the total absence of fructification its position cannot be positively determined. It is to be hoped that at some future period Mr. Luxford will be fortunate enough to meet with fertile specimens.

No. 2, Mr. Berkeley informs me, is certainly a Zygodesmus (a genus of Corda, characterized as follows): —

Tribe.—MUCEDINES.

ZYGODESMUS. Flocci creeping, branched, entangled, septate or suddenly staple-bent so as to form a geniculus ("geniculati-contracti"),* and afterwards paired by branches or geniculi developed at right angles, otherwise one floccus coupled wth another: sporidiferous branchlets erect or wart-shaped: spores acrogenous, simple, at length irregularly scattered: episporium membranaceous, smooth or hairy; nucleus solid.—*Corda, Icon. Fung.* pt. 5.

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* There appears to have been some mistake in the application of this phrase, at least as regards the species now described, though Mr. Berkeley's sketch of it exhibits

Z. *Berkeleyi*, (Ryl. MSS.) Flocci spreading, horny, brown, branched, with hemispherical swellings ("geniculi") produced at many of the septa, from which originate the branches? Sporidia oval or ovate, smooth; nucleus simple. Fig. 2, *f*, *g*, and 3, *x*, *y*, (the sporidia).

On Monotropa roots generally.

No. 3 is also an undescribed species.

### Tribe.—SEPEDONIEI.

SEPEDONIUM, *Link.* Sporidia globose (filled with sporidiola), at first covered by the flocci of the fleecy mycelium.[†] *Eng. Flor.* vol. v. pt. 2, p. 350.

S. *Wilsoni*, (Ryl. MSS). Flocci fleecy, interwoven or fasciculate, adnate, pellucid, white, rarely dichotomously branched: sporidia globose, tubercled or granulated, not appendiculated, but attached by the disk on their flattened surface? Fig. 2, *h*, *i*, *k*, *l*.

On Monotropa from Southport.

Since the former portion of this article was written, I have examined a dried specimen of Monotropa gathered at Streatley, Berks, sent because it had the flocci considered to be roots, growing on its capsules and stem; on examination I found the following:—

### Tribe.—DEMATIEI.

CLADOSPORIUM, *Link.* "Sporidia arranged in" (more or less) "moniliform branchlets, at length falling off; flocci septate (above"?). *Eng. Flor.* vol. v. pt. 2, p. 338.

C. *Leesii*, (Ryl. MSS.) Flocci spreading, pellucid, straw-coloured: sporidia of various sizes, contained in branchlets, which are at length moniliform and septate? yellow, as the flocci. Fig. 3, *p*, *q*, *r*.

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the character. The "geniculi," viewed with a power of 350 diameters (by Ross), appear to be only tumours; the outline of the floccus opposite them is perfectly continuous, and what have been considered contractions or doublings seem but to be septa left in some measure free by the swellings. Vide fig. 2, *g*.

[†] As this species is allied to a parasite of Monotropa already described, though not to be found in the 'English Flora,' it may be well to add the description as given by its discoverer.

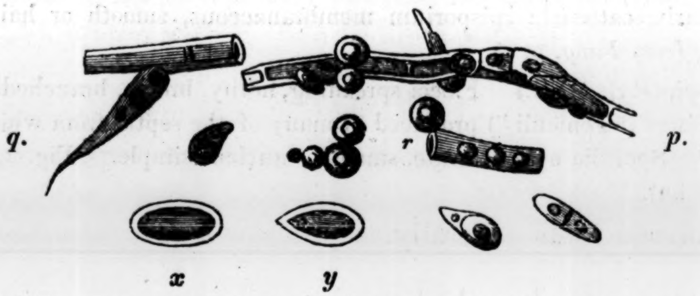
TUBURCINIA, *Fries.* Sporæ rotundatæ, inæquales, opacæ; sporidiis minimis, succedentibus farctæ, plantis putridis innatæ; floccis variis, tenellis, intertextis, evanescentibus, primo adherentibus.

T. *Monotropæ.* Erumpens, sporis nigro-fuscis inæqualibus flocci evidentioribus.

Præcedenti (T. Orobanchæ) affinis, sed magis superficialis est, et erumpens, sporidia fuscescent, et flocci copiosiores adsunt.

Genus quoad fructificationem ad Sepedonium accedit.

FIG. 3.



*p. Cladosporium Leesii*, showing the structure of the flocci, and a septate sporidiferous branchlet. *q.* Sporidiferous branchlet in a younger stage. *r.* A portion where the sporidia appear to have been matured in the main portion of the floccus. The four figures not referred to are various forms of sporidia. *x, y.* The sporidia of *Zygodesmus Berkeleyi*.

It is with no design to forward my own views that three of the four species are placed in genera already recognized; my feelings were for long opposed to this, but after mature examination I could find no differences sufficient whereon to found new characters. It is true, that two of the species do not *perfectly* accord with the genera in which they have been placed, such having been constructed with reference only to the kinds then known; so slight however are the discrepancies, as will be seen by the parentheses, that I have deemed it but prudent to admit them.

THOMAS G. RYLANDS.

Bewsey House, Warrington,
September 14, 1842,

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## ART. LXXXIX. — *Analytical Notice of the 'Transactions of the Botanical Society.'* *Vol.* i. *pt.* ii. Edinburgh: Maclachlan, Stewart & Co.; H. Baillière, London. 1841.

(Continued from p. 322).

### VIII. *On the Botanical Characters of the British Oaks.* *By* R. K. GREVILLE, LL.D., F.L.S., &c., *Vice-President of the Botanical Society.*

FOR three years previously to the publication of this paper the author was engaged in the examination of the British oaks, with a view to ascertain the characters by which each so-called species may be distinguished from its congeners: the results of this investigation are here published. The paper is accompanied by two plates, wherein are delineated the most striking forms of leaf which have come under the author's notice, together with the peduncle and young fruit; and the author observes that "in an extensive series of specimens, these forms are united by intermediate links." In his preliminary remarks he also states: —

> "When I first approached this subject with a view to ascertain the value of the characters by which the British Oaks are supposed to be distinguished, I was under a strong impression, that at least, the two forms recognised as species under the names of *Robur* and *sessiliflora* were really distinct. But I soon found that the ascribed characters were of little importance in rigid specific discrimination, and that the only one of any value at all, viz., the sessile or pedunculated fruit, must be received with so much latitude as greatly to weaken, if not to render it entirely unworthy of confidence."—p. 65.

The following remarks are made on "the characters supposed to reside in the leaves."

1. The petiole in Quercus Robur is said to be short; that is, in the form so called the petiole is supposed to be shorter than in either Q. sessiliflora or intermedia. In two of the figures "which certainly do not represent Q. Robur, they are shorter than in several of the forms which undoubtedly belong to that plant."

2. The *general* outline of the leaf. This cannot be defined "so as to distinguish any of the forms as species, as they run insensibly into each other. Nay, some of the forms in Q. Robur are absolutely repeated in Q. sessiliflora."

3. The characters supplied by the *strict* outline of the leaf and of its several parts, appear to be equally unsatisfactory. "The base varies equally in all the forms." "In Q. Robur, although generally more or less bi-auriculate, it is sometimes rounded, and even attenuated," and such is the case in Q. sessiliflora also. No greater importance is to be attached to the pinnatifid character of the leaf; the lobes of the leaf too "are sometimes rounded, when the sinuses are acute, and *vice versâ;* and sometimes both lobes and sinuses are obtuse, at others both are acute." The starry pubescence attributed by Prof. Don to Q. intermedia, the author finds to be present in the young state of almost all the forms he has figured, and it may be traced in nearly the whole series of his fully developed specimens.

> "If the leaf be taken in conjunction with the peduncle, no character whatever is afforded; and I agree with Mr. Leighton, who has truly remarked that the leaves of our oaks 'vary without the least reference to the absence or presence, or relative length of the peduncle.' If the peduncle alone be taken as a guide, we shall in vain search for an immutable character, for every intermediate state is to be observed between the elongated peduncle as I have it from Cumberland, 5 inches long, and from Killin, above 4 inches long, to its total absence.

"When the peduncle becomes shorter, it is generally thickened or distorted; and when present, as it often is in Q. sessiliflora, it is very short and robust. It would appear, that in proportion as the peduncle deviates from the normal state, as we observe it in Q. Robur, and becomes more and more contracted, the acorns (no longer produced at the usual intervals) are developed in a clustered manner, till at length the peduncle becomes so short, as to render them almost, if not really sessile. The acorns of the British oaks are as sportive as the leaves; so that no characters which have been hitherto employed, taken singly or in combination, seem to be available for separating our native oaks."—p. 67.

"Were we to be guided by the result of such an examination as I have been able to institute, into the characters hitherto employed for botanically distinguishing the British oaks, we should be led to conclude that we certainly possess only one native species. At the same time, it is quite possible that characters may have been overlooked, which may really suffice to separate them. A remarkable difference in the timber has long been observed, that of Q. sessiliflora being termed Red Oak,—that of Q. Robur, White Oak, from the colour of the wood. The relative merits of the two kinds do not seem to be quite satisfactorily established; but the greatest weight of testimony seems to be in favour of red oak (Q. sessiliflora), contrary to the expressed opinion of Sir J. E. Smith.

"It may still be a question whether the superiority of the one timber over the other depends upon the specific difference of the tree. The subject is one of vast practical importance, and still requires much investigation. It has not been in my power to examine the wood of the trees from which my specimens were obtained, and therefore I am unable to throw the smallest light on this part of the subject. My only object at this time is to show, that the received botanical characters by which Q. Robur, Q. intermedia, and Q. sessiliflora are at present distinguished, pass insensibly and completely into each other, and cannot therefore be depended on, in collecting acorns for seed, and supplying the dock-yard with timber."—p. 68.

## IX. *On the Vegetation and Botany of the Island of Madeira.* By James Macaulay, A.M., M.D., *Foreign Secretary of the Botanical Society.*

The author observes that the island of Madeira "may be termed a *Transition* station between the European and the African vegetation, and intermediate between the temperate and intertropical regions of botanical geography." In character its Flora appears to be most allied to that of the northern shores of the Mediterranean, notwithstanding the situation of the island off the African coast, between 32° and 33° N. lat. Many of the plants however are species not found in Europe, although they belong to European genera; some species are peculiar to the island, while others are common to Madeira, the Canaries and the Atlantic isles.

"The scenery is of the most glorious character, both as respects the beauty of the cultivated parts and the sublimity of the mountain districts of the island. In the interior, and on the north coast especially, the traveller meets with combinations of natural objects such as in no other part of the world can be witnessed, and which obliterate every conception that had previously been formed of the grand and sublime in scenery. This is greatly the result of the geological character of the island. The mountains have not the integrity of outline and tame regularity of form that always appear in some of the formations of older geological epochs, but are composed of the most recent basalts and other igneous rocks; and, on a scale of alpine magnificence, present a scene of the wildest confusion, being everywhere deeply riven by rugged ravines, the precipitous cliffs of which are clothed to the very summit with ancient forests. Among these wild scenes there occur landscapes of the utmost loveliness, so that the scenery is altogether perhaps the finest in the world."—p. 71.

The climate and temperature of the island are quite as varied as its scenery. In sheltered spots on the south coast there is a tropical temperature, and there the climate remains more genial than an English summer; while "on the opposite coast, and in the interior of the island, the mountains are covered with snow, and all the rigour of a northern winter is experienced. Between these extremes every degree of climate is met with, and the range of vegetation varies accordingly." The author mentions some of the peculiarities arising from these varieties of climate, in connexion with the changes of the seasons.

"During the winter the residents on the coast look up from amidst their tropical vegetation and genial temperature, through every degree of climate and verdure, to the bleakest desolation on the snow-covered hills above them. In the declining months of the year, again, while on the coast the summer foliage is yet unaltered, and the influence of the sun little diminished, the upper parts of the landscape present the variegated tints and the fading foliage of autumn."—p. 72.

The author gives the following as "the most marked zones of botanical climate on the south side of the island."

"1. Region of Heaths—beyond 3500 or 4000 feet above the sea. Erica arborea is the most characteristic plant of this climate.

"2. Region of Laurels—from 3000 to 4000 feet. Laurus indica, Laurus Til, and other indigenous evergreen forest trees chiefly clothe the mountains in this zone.

"3. Region of European Trees—from 2000 to 3000 feet. Forests of chesnut and other trees introduced from Europe here principally flourish.

"4. Region of the Mediterranean Flora—from 1000 to 2000 feet. In this zone the plants of Southern Europe abound, and numbers of the trees and flowers of temperate climates have been introduced. The upper limit is marked by the vine being scarcely cultivated beyond 2000 feet above the sea.

"5. Sub-Tropical Region—from the level of the sea to 1000 feet above. The limit of this zone is well marked by a Cactus, the Opuntia Tuna of DeCandolle, which grows on the cliffs on the coast, and does not reach higher than 1000 feet.

"6. Tropical Region. In a few sheltered spots on the south coast many of the West Indian and other tropical fruits flourish."—p. 73.

The following extracts are in accordance with an opinion we have frequently ventured to express, namely, that although elevation and climate doubtless exercise considerable influence over the vegetation of a district, yet that an influence fully as powerful is exerted by the character of the soil.

"The geological structure of the island is almost wholly volcanic, basalts and basaltic conglomerates and other igneous rocks forming the whole mass of the island. At one or two places there appear beds of tertiary limestone and other non-volcanic formations, but in so very small a proportion to the whole surface, as to have no effect upon the character of the vegetation."—p. 72.

"The indigenous Flora is smaller than might be expected from the range of climate, the effect probably of the want of variety of soils, and the absence of other causes of difference of vegetation. The most conspicuous natural families are, the Filices, the Laurineæ, the Compositæ and the Labiatæ. Of the Ericeæ, there are two plants which attain to a remarkable growth in the island,—Vaccinium maderense and Erica arborea. The whortleberry forms little thickets or forests on the mountain sides, often from fifteen to twenty feet in height. The heath grows everywhere on the mountains beyond 2500 or 3000 feet above the sea. On Pico Ruivo, the highest peak in the island, it commences at about 3500, and covers most of the mountain side to nearly the summit, which is more than 6200 feet above the sea. The stems are frequently six, and sometimes eight feet in circumference.* The wood is very hard, and is used for most of their common work by the peasants. The other indigenous forest trees chiefly belong to the Laurineæ. The Laurus indica, Vinhatigo of the natives, grows to an immense size. Its wood is of a dark colour, and of excellent quality, and is employed in various articles of work, under the name of Madeira mahogany. Of foreign trees, the most conspicuous is the chesnut, Castanea vulgaris, which was introduced by the early settlers; it forms fine woods on the lower parts of the mountains, especially in the interior, and on the north coast."—p. 73.

## X. *On the Specific Value of the Antherine Appendages in the Genus Viola. By* EDWARD FORBES, M.W.S., *Foreign Secretary of the Botanical Society.*

MR. FORBES observes that "form is the chief if not the only source of *specific* character in the vegetable kingdom:" the higher divisions are founded on modifications of the *internal* structure of plants, but in characterizing minor groups and species, we ought rather to attend to the modifications of external form. The reason for this will be apparent when we consider that in plants, contrary to what obtains among animals, external form itself is often structure, or rather it is equivalent to the internal structure of animals: for structure being a modification of form for the performance of some function in the economy of the creature, "in animals such modification is usually an involution of form, in plants the reverse."

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* Sir J. E. Smith, in his 'Tour on the Continent,' says—"I never saw Erica arborea so truly arboreous as in this place, [between Frejus and Cannes]. It was often ten feet high, with a trunk three inches in diameter, much resembling, in form and size, the trees on Box-hill in Surrey. I am informed by Dr. Lind, that it grows to a much larger size, even 18 inches in diameter, on the Serra at Madeira, 5165 feet above the sea."—i. 210, Ed. 2.

Naturalists are aware that in the lowest as well as in the highest groups, whether of plants or animals, there is no organ which is equally and uniformly available as affording distinctive characters. "For example, the shape of a leaf in one genus of plants may be common to all the included species, and therefore is not a specific character; in the next genus it may vary in each species, and the variation be constant in each, becoming the most evident source of distinction between the species." This depends on what Mr. Forbes terms "*the law of undulation of character*," that is, "either on the adaptation of organization to circumstances," or on "modifications of forms &c., of no importance in the animal or vegetable economy, though of great value as marks to distinguish one original form (that is species) from another. In the last case, the character is usually also *representative*, that is, it may be the *analogue* of an organ which plays an important part in some other species, group, or type."

The author has chosen the genus Viola as affording illustrations of his positions.

> "Among the irregularly-flowered genera of the family of Violarieæ, we often find certain of the stamina provided with dorsal appendages, styled by some botanists nectaries, which are lodged in the spur of the flower. In the descriptions of violets, mention is rarely made of these bodies, they being generally regarded as of generic importance only. Any one, however, who compares the nectaries of a pansy with those of a dog-violet, will see such a difference, as indicates a specific, at any rate, a sectional importance. In order to ascertain the value of the character so derived, I have compared minutely above seventy species of violets; and the results of such comparison, and their application to the elucidation of British Botany, I now lay before the Society."—p. 77.

1. *Form of Nectaries.* In the allies of V. canina they are *lancet-shaped*,—the most common form; in the pansies they are *linear;* and the rarest form is the *rotund*, found in V. palustris. These are the only three forms in the genus; the first varies in length and breadth, the linear in length.

2. *Relations of Nectary and Spur.* The spur varies in proportion according to the form of the nectaries; "it is usually thick in proportion to its length, and very blunt," when the nectaries are lancet-shaped. "The rotund nectary is associated with a very short

rounded spur, the linear usually with a long slender spur, often of great length, as in the pansies."

3. *Relation of Nectary and Colour of Flower.* Mr. Forbes is disposed to consider that greater importance is due to colour in specific distinctions than is usually assigned to it.

> "In the genus Viola blue, yellow, purple and white are the colours seen. The blue may again be divided into purple-blue and sky-blue, each passing abnormally into white, but the respective whites must not be confounded. The purple-blue may also pass abnormally into rose; but the sky-blue, as far as I am aware, never does. These distinctions are of importance in the investigation of nearly allied species, such as V. canina and V. montana. The yellow passes on the one hand into white; on the other, into purple. White is rarely the normal colour of a species of violet. The lancet-shaped nectary is chiefly associated with blue flowers, sometimes with the yellows passing into white, never with the yellows which pass into purple. They have always linear nectaries. The violets, which are normally white, derived from blue, have always lanceolate or rotund appendages, never linear. The odorous violets have always purple-blue, or its derivative white flowers, and always lancet-shaped appendages, but the colour does not necessarily imply the odour. The yellows which do not pass into purple have always lancet-shaped appendages. Among the dog-violets we find the lancet-shaped appendages lengthening in proportion to the mixture of purple in the blue, and the contrary in cerulean flowers, and their derivatives milk-white. All violets may be abnormally white, but the form of the nectary peculiar to the species, does not change with the change of colour in the individual."—p. 79.

4. *Relations of Nectary and Leaf.* The cordate leaf in violets is generally associated with a lancet-shaped nectary, which is always found when the leaf is lanceolate or truly ovate, and sometimes when through being deeply lobed a cordate or rotundo-cordate leaf becomes pinnato-palmate. "A few cordate-leaved violets have linear appendages, and some of the pinnato-palmate; but all the pansies, or violets with ovato-spathulate leaves have linear nectaries." In the stemless species with cordate leaves, "as the leaf becomes more and more rounded there is generally a tendency in the nectary to become shorter and shorter, whilst the contrary is often the case in such as have stems. Rotund appendages are associated only with reniform-cordate leaves."

Mr. Forbes gives a tabular view of "the relations of leaf and nectary in seventy-one species of violets."

5. *Relation of Nectary to Bractioles and Stipules.* The relation borne by the bractiole to the nectary is one of size, not of position,—the linear nectary being generally associated with minute bractioles: the stipules "are almost always large when the nectary is linear."

6. *Relation of Nectary to Stem.* In the arborescent, and generally in the shrubby violets the nectary is lanceolate; in the more herbaceous stemmed species it is usually linear; while in most of the

stemless violets, including the odorous species, it is lancet-shaped, in a few only being linear.

### 7. *Geographical distribution of Violets, according to their Nectaries.*—

"Violets are found in most parts of the world, though their distribution is influenced materially by climate. The species from tropical countries are mostly from localities where the influence of elevation has neutralized or modified the climatal influence. The various sections of the genus have geographic centres, as may be seen in the congregations of the allies of *hirta* in North America, and of those of *tricolor* in alpine Europe. North America may be looked upon as the capital of the whole genus, since we find there representatives of all its subdivisions. In the following table the distribution of 75 species, according to the form of their nectaries, is exhibited:—

| | Europe, | Asia | Africa | N. America | S. America | Australia | Total |
|---|---|---|---|---|---|---|---|
| Lancet-shaped | 19 | 4 | 1 | 22 | 1 | 1 | 48 |
| Rotund | 2 | 0 | 0 | 1 | 0 | 1 | 4 |
| Linear | 12 | 4 | 1 | 6 | 0 | 0 | 23 |

### 8. *Application of the above considerations to the arrangement of the Violets.*—

"To group the violets according to the form of the nectary, without considering the relation of that form to the other characters of the plant, would be to arrange them artificially and not naturally; for then we should have such violets as *ochroleuca* and *prionantha* associated with the pansies, and other combinations of a similarly unnatural character. But associating the form of the nectaries, with that of the leaf, with the colour, and with the geographical distribution, we obtain a very natural arrangement of the species. The odorous and hairy violets, presenting short lancet-shaped nectaries, cordate leaves, often being hairy, and frequently nearly orbicular, purple-blue flowers, no stem, and a centralization of the species in North America, form a *first* group. The same form of appendage, but usually more developed as to length, combined with a cordate or lanceolate leaf, smooth, or slightly hairy, a stem, purple-blue or cerulean flowers, and an almost equal distribution in the old and New Worlds, indicate a *second* equally natural, which may be represented by *V. canina.* *V. palustris* is the type of a *third*, and *V. biflora* of a *fourth*; the former associating a reniform leaf with a rotund appendage and a cerulean flower, and the latter a similar leaf with an abbreviated lancet-shaped appendage and a yellow flower. The linear nectary, combined with a yellow flower and cordate leaves, forms a *fifth*; parallel to which may be placed (*sixth*) such as have pinnate leaves, blue flowers and linear nectaries. Lastly, the pansies form a most natural group (*seventh*) of themselves, presenting us with flowers of all colours, linear nectaries, leaves peculiar to themselves, lyrate stipules, and a centralization in the mountainous countries of the western portion of the Old World."—p. 81.

## XI. *An Attempt to ascertain the true Hypericum quadrangulum of Linnæus.*

*By* CHARLES C. BABINGTON, M.A., Cantab., F.L.S., F.G.S., &c.

The author observes that the difficulty attending the determination of the Hypericum quadrangulum of Linnæus, has arisen from a belief that Linnæus himself referred to different species by that name. In the Linnæan herbarium are two specimens, on "different papers pinned together, the first of which is the *H. quadrangulum* of Eng. Bot. (t. 370), and has a number appended referring to the Sp. Pl.; the other is the *H. dubium* of Leers (Eng. Bot. t. 296), and has the same number attached to it, and also the name of "*H. quadrangulum*." Linnæus first described his H. quadrangulum in the 'Hortus Cliffortianus,' (p. 380), where it is said to have "*Folia calycina subulata*," and Morison (vol. ii. t. 6, f. 10) is referred to as the original authority. Morison's plant is the H. quadrangulum of Smith, "which has the *folia calycina subulata*," while in the H. dubium of Leers and Smith they are "broad and very obtuse." Linnæus, in all his subsequently published works, refers to the 'Hortus Cliffortianus' as the authority for his H. quadrangulum; and as the plant so named in Smith's works and figured in 'English Botany' agrees with that described by Linnæus in having subulate calyx-leaves, there can be no doubt of its being the Linnæan H. quadrangulum.

Mr. Babington next shows that the plants named *H. dubium* by Leers and Smith, *H. quadrangulum* by Fries and Wahlenberg, *H. maculatum* by Crantz and Allioni, and *H. delphinense* by Villars;—"constitute two well-defined and truly distinct species," although the above names are generally considered synonymous. The paper concludes with the descriptions and synonymes of the three species, so far as the author has been able to determine the latter, "but in nearly all cases, excluding the synonymes cited by the respective authors."

1. *Hypericum quadrangulum*, Linn. Stem erect, 4-winged: leaves oval-oblong or elliptical, with pellucid dots: sepals erect, lanceolate, acute, entire; petals lanceolate. "*Linn. Hort. Cliff.* 380; *Leers, Herb.* 168; *Crantz, Aust.* 89; *Sm.! Fl. Brit.* 801; *Eng. Bot.* 370; *Gaud. Helv.* iv. 625; *Host, Aust.* ii. 78. H. tetrapterum, *Fries, Nov. Suec.* (ed. 1) 94, (ed. 2) 236; *Reich.! Excurs.* No. 5179; *Koch, Syn.* 134; *Fl. Siles.* iii. 83; *Kunth, Berol.* i. 70; *Bab.! Prim. Sarn.* 19; *Leight. Shrop.* 372. H. quadrialatum, *Wahl. Suec.* ii. 476. Androsæmum Ascyron dictum, caule quadrangulo glabro, *Morrison*, ii. 471, sect. 5. tab. 6. fig. 10."

"I have not ventured to refer to any of the other works of Linnæus, because he appears to have confounded the following species with this in all his later works."—p. 87.

2. *H. dubium*, Leers. Stem erect, obsoletely quadrangular: leaves elliptical, obtuse, with few pellucid dots: sepals reflexed, broadly elliptical, obtuse, very entire, with many black dots on the outside; petals elliptical, with many black dots beneath. "*Leers*, 169; *Sm.! Fl. Br.* 802; *Eng. Bot.* 296; *Gaud.* iv. 626; *Wallr. Sched. Crit.* 401; *Host*, ii. 79; *Boenningh. Monaster.* 227. H. quadrangulum, *Fries*, 237; *Ber-*

*gius, Mat. Med.* (ed. 2) p. 679; *Koch,* 134; *Fl. Siles.* iii. 83; *Sven. Bot.* t. 359; *Wahl.* ii. 478; *Sadler, Fl. Pesth.* 351; *Kunth,* ii. 70."

3. *H. maculatum,* Crantz. Stem erect, quadrangular: leaves ovate-elliptical, obtuse, with few pellucid dots: sepals reflexed, ovate-lanceolate, toothed, obtuse, mucronate, with pellucid striæ; petals elliptical, obtuse, with purple striæ and dots beneath. "*Crantz, St. Aust.* (ante 1769), *ed. alt.* 98; *Allioni, Fl. Pedem.* (1785) ii. 45, t. 83, f. 1, (optime). H. delphinense, *Villars*! "*Fl. Delph.* (1785) 81;" *Hist. Plant. Dauph.* (1789) iii. 497, t. 44, (male); *Reich.*! *Fl. Exsicc.* No. 1500. H. quadrangulum, *Leight.*! *Shrop.* 370.

## XII. *Notes on the Distribution of British Ferns.* By H. C. WATSON, F.L.S.

MR. WATSON commences his admirable remarks by observing that "excepting some spots of small extent, whence they are banished by local peculiarities of the surface, ferns may be said to range over the whole of Britain, from south to north, from east to west, and from the shores of the sea almost to the summits of the loftiest mountains; from which latter situation they are probably absent, rather in consequence of the bleak exposure to wind, than of the diminished temperature incidental to the height of any of our mountains."

The number of species of British ferns will be variously estimated, according to the views entertained by botanists regarding specific limits. "The lowest estimate may be taken at 34; which is raised to 36, by the inclusion of two species now supposed to be extinct, and, perhaps, never found wild in England, namely, Asplenium fontanum and Trichomanes brevisetum." The latter number will be raised to 40, by those botanists who regard as distinct species the following plants:—Polypodium Dryopteris and calcareum; Aspidium lobatum and aculeatum; Asplenium Ruta-muraria and alternifolium; and Cistopteris fragilis and dentata. "And the number of 40 would be still farther augmented by the addition of four other varieties, which are sometimes accepted for species, namely,—

"Aspidium angulare, a variety of A. aculeatum or lobatum.
"Aspidium dilatatum, ... A. spinulosum.
"Aspidium dumetorum, ... A. dilatatum or spinulosum.
"Cistopteris angustata, ... C. dentata or fragilis."

Then again a few botanists would raise to the rank of species Aspidium recurvum and Asplenium irriguum; while others would regard as varieties Cistopteris alpina and Woodsia hyperborea; "but since their views are not shared by many, we may hold our ferns to be estimated at 36, 40, or 44."

The number of species of indigenous flowering plants would in like manner vary, according to the views of the party by whom the estimate might be made. "By rigidly excluding all species not fully recognised as indigenous, and also numerous varieties which are commonly now counted amongst species, the flowering plants of Britain will be found scarcely to exceed 1200; or, admitting doubtful species, but still excluding doubtful natives, they may be taken at 1400. To reach the number of 1636, given in the Catalogue printed by the Botanical Society of Edinburgh,* we must admit many species of foreign introduction, and a goodly list of varieties named and received as species." But in determining the proportion borne by the ferns to the flowering plants, "if we take a low estimate for one group, we must follow the same rule in the other, or their proportions will unavoidably appear wide of truth." The proportions of the two groups taken from the three estimates of the number of each given above, will be these.

| "FERNS. | FLOWERS. | PROPORTIONS. |
|---|---|---|
| 36 | 1200 | 1 to 33⅓ |
| 40 | 1400 | 1 to 35 |
| 44 | 1636 | 1 to 37" |

The author by way of comparison next gives a table showing the relative numbers of ferns and flowering plants in eight different Floras; the proportions (omitting fractions) being as under.

| | | | | | |
|---|---|---|---|---|---|
| Iceland ........ | 1 to 25 | Channel Isles | 1 to 51 | Sweden ...... | 1 to 40 |
| Faroe ........ | 1 to 27 | Belgium ...... | 1 to 67 | Lapland ...... | 1 to 25 |
| Ireland ........ | 1 to 30 | Zealand ...... | 1 to 47 | | |

"Ferns are thus seen to bear a larger proportion relatively to flowering plants, in the northern and mountainous parts of Western Europe, than is the case with this group of plants in low countries,— such as Belgium, Zealand, and the Channel Isles, —whose latitude nearly corresponds with that of England; whilst the proportions before set down for Britain place it in the scale betwixt Faroe and Iceland, on the one hand, and Belgium and the Channel Islands on the other; the former having a relative predominance of ferns, the latter having a similar predominance of flowering plants."—p. 91.

It is then shown by a comparison of twenty local Floras, that the distribution of ferns in Britain corresponds with their distribution in the north-west of Europe generally, since both the relative and absolute number of species diminish "as we pass from the hilly districts of

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*The 1st edition of the Catalogue is here referred to; the number of species (1636) given in the "Enumeration of Plants" prefixed to the Catalogue appears to include the ferns as well as flowering plants. In the 2nd edition the number of species in the two groups is distinctly given as 1594 and 55, (including Lycopodium, Isoetes, Pilularia and Equisetum).

Scotland and the north and west of England, towards the low south-eastern countries lying nearest to Belgium." In Yorkshire, according to the table given, there are 36 ferns and 1002 flowering plants; or 1 to 28: the Faversham and East Kent Flora, on the contrary, furnishes only 13 ferns and 806 flowering plants, or 1 to 62: these being the extreme proportions afforded by the twenty Floras examined.—The Midland Flora has 23 ferns and 840 flowering plants, or 1 to 37.

Mr. Watson remarks that "York is pre-eminently the county of ferns;" for although the author of the Yorkshire Flora "has multiplied species more than many other writers on local Botany," the ferns are really most numerous in that county. This the author attributes to various causes, such as its central position, and the diversified character of the country; "the climate of its low vales being sufficiently mild for the growth of species which shun the northern counties of Scotland, without being too warm or dry for the growth of boreal species, to which the hilly districts of its western border are particularly suited, as well as to the production also of the more exclusively mountain species." Then again its coast furnishes Asplenium marinum, and its various soils and rocks are adapted for those species which are attached to particular formations.

In Cambridgeshire there are 14 ferns and 847 flowering plants, or the ferns are as 1 to 60. This paucity of ferns is also explained by a reference to the character of the county. A large portion consists of low fens, with but little wood and few hedge-rows; "much of the rest is composed of gentle undulations of chalk," of inconsiderable elevation, with few trees and little water.

"Moray ranks next to Yorkshire in the high proportion of its ferns," (1 to 30). This is accounted for by "the rigid exclusion of introduced species of flowering plants" by the author of the Moray Flora.—On the other hand the number of flowering plants in Northumberland and Durham is high (1030), in consequence of "the addition of many species brought to the coasts of those counties in ship ballast." In the absolute number of species (28) the ferns of these counties rank next to Yorkshire, although, from the cause above mentioned the proportion borne by them to flowering plants is much lower, (1 to 37).

It is evident from the variation in the number of ferns in the several districts, that some species must have a partial range; accordingly it appears that "no one of the district Floras includes all the native species, whilst about half of these Floras include fewer than half of the species." Some species are so widely diffused and so abundant in individuals, that they are probably to be found in every county; others again are either confined to a few localities, or have a wide range over certain parts of the island although excluded from others.

A table is next given wherein are enumerated forty-three species, showing in how many of the twenty local Floras before mentioned, and in what number of twenty-four manuscript lists, the name of each species occurs. By this means may be gained a tolerably correct idea of the range of our native ferns; although, as the author observes, "without regard to the distinctness of the species, the dates of their first discovery, and the certainty of their nomenclature," erroneous conclusions might be drawn from the list.

Pteris aquilina, Polypodium vulgare and Aspidium Filix-mas are the only three species "so universally distributed as to be included in all the forty-four district Floras and lists." But although these are our three commonest ferns, yet to neither of them does the widest geographical range in Britain belong. "The most widely ranging of our native ferns, taking into view the three directions of latitude, longitude and elevation, are Blechnum boreale and Aspidium dilatatum (or spinulosum)."

> "It has been already stated that ferns prevail chiefly in the hilly tracts towards the north and west, and that they are less numerous in the low south-eastern counties of England,—a peculiarity that is doubtless in great measure attributable to the more humid and cooler atmosphere of the former. The three circumstances on which this difference of climate depends, are those of latitude and longitude, conjointly with elevation of the surface; and the influence of these three conditions in producing the general result, will scarcely admit of divided consideration. We may, indeed, trace some agreement betwixt the range of certain species and the geographical divisions of latitude and longitude; yet this connexion (or, more strictly, this coincidence) is so much interfered with by the third condition, that of height, as to render separate investigation almost useless."—p. 97.

In proof of these positions it is remarked that about half the number of indigenous ferns are absent from the English counties lying to the east of Gloucestershire and Nottinghamshire; "whilst none of the species found growing in these south-eastern counties are wholly wanting in those to the westward of them; most of these species also being much more plentiful in the western counties." The paucity of ferns in the south-eastern counties is accounted for by the different character of the surface, owing to the absence of rocky ravines, waterfalls and mountain elevations, and the consequent dryness of atmosphere, rather than by the difference of longitude.

Nor is the northern or southern limit of a fern's range altogether to be determined by the degree of latitude, though they may be more decidedly traced than the longitudinal boundaries; yet even in this case the author states the lines of cessation to be determined more by "the hilly and broken character of the surface" than by the degree of latitude; and instances the hills of Wales as bringing "several species into a more southern latitude than it is at all likely they would have been found in, if Wales and the adjacent English counties had been as little diversified with high hills as are the counties under the same latitude on the eastern side of the island."

> "The effect of the mountains, however, is probably much more decidedly shown in prolonging the southern range than in arresting the northern range of ferns; since the low coast-line, as well as small plains and valleys around, or amongst the hills, may still afford suitable localities for such ferns as are unfitted to bear the climate of the mountain summits or acclivities, although capable of growing in the climate incidental to the latitude."—p. 98.

The author's classification of ferns according to their range in Britain, and his observations, are very interesting. Those are first given which "may be considered to have a range of latitude almost through the whole of Britain."—

- Cistopteris fragilis
- Polypodium Phegopteris
    - vulgare
- Pteris aquilina
- Blechnum boreale
- Botrychium Lunaria
- Ophioglossum vulgatum
- Osmunda regalis
- Scolopendrium vulgare
- Hymenophyllum Wilsoni
- Aspidium lobatum
    - Oreopteris
    - Filix-mas
    - spinulosum
- Aspidium dilatatum
- Asplenium Filix-fœmina
    - Trichomanes
    - Ruta-muraria
    - Adiantum-nigrum
    - marinum

Four of the above twenty species "are very rare in the south of England, namely, Botrychium Lunaria, Cistopteris fragilis, Hymenophyllum Wilsoni and Polypodium Phegopteris, especially the last; and they are not found at all in the Channel Isles." Asplenium marinum, Scolopendrium vulgare, Ophioglossum vulgatum and Osmunda regalis, are decidedly rare in the north of Scotland, "and they are not found at all in the Faroe isles, though the Ophioglossum is stated to grow in Iceland."

The following are "boreal and mountain ferns, which are unknown southward of the Thames."—

- Woodsia hyperborea
    - ilvensis
- Cistopteris alpina
- Cistopteris dentata
- Polypodium Dryopteris
- Asplenium viride
- Asplenium septentrionale
- Aspidium Lonchitis
- Cryptogramma crispa

Four species are given as being chiefly "confined to the middle latitudes of Britain."—

Aspidium cristatum
rigidum
Asplenium alternifolium
Polypodium calcareum

Four species "affect the southern, or southern and midland counties, being absent from the northern counties."—

Adiantum Capillus-Veneris
Asplenium lanceolatum
Aspidium Thelypteris
Grammitis Ceterach

Of four others either the range is undetermined, or their specific distinctness is questionable.—

Hymenophyllum tunbridgense
Aspidium aculeatum
Aspidium angulare
dumetorum

"Two remaining species, if ever found in England, and not now extinct, are exceedingly local in the north of England."—

Asplenium fontanum
Trichomanes brevisetum

The author observes that more complete and accurate observations are yet required "with regard to the limits of ferns in ascending the mountains;" and refers to Francis's 'Analysis of British Ferns' as containing nearly all that has been published on the subject. Five are mentioned as certainly rising "almost to the summits of the highest hills in Scotland," being found at an elevation of between 3000 and 4000 feet; the two first probably above 4000 feet.

Cryptogramma crispa
Blechnum boreale
Polypodium Phegopteris
Aspidium (dilatatum ?)
Lonchitis

The following occur "at a lower elevation, but still probably above 2000 feet, and some perhaps above 3000 feet."—

Botrychium Lunaria
Woodsia hyperborea
ilvensis
Asplenium viride
Cistopteris alpina
dentata
Cistopteris fragilis
Polypodium vulgare

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"On quitting the mountain tracts, we leave the four following species behind us:"—

Woodsia hyperborea
ilvensis
Aspidium Lonchitis
Asplenium viride

Two others, being rare on the isolated lower hills, may be classed with the mountain ferns.—

Cryptogramma crispa
Asplenium septentrionale

Eight species, found chiefly in the hilly districts of the north and west, yet occasionally occur " so far from the mountain tracts, that they cannot be held in the character of exclusively mountain ferns."—

Cistopteris alpina
dentata
fragilis
Hymenophyllum Wilsoni
Polypodium Phegopteris
Dryopteris
Polypodium calcareum
Botrychium Lunaria

It is next remarked that " under the combined influence of latitude and longitude, thus modified by the effect of elevation of surface, the lower limits of many ferns, equally as those of flowering plants, appear on a map like irregular lines, whose general direction runs from south-west to north-east; whilst their upper limits encircle the hills, or the hilly tracts, like zones or belts." It must not, however, be supposed that by terminal lines are to be understood any others than "artificial lines, drawn on a map, so as to connect the extreme stations for any species in either direction." Also the terms *upper* and *lower* limits are to be understood as applying " to latitude, to elevation above the sea-level, and also in some measure to the degree of proximity to the mountain tracts." In the neighbourhood of the latter a great change in the character of the Flora of a district becomes evident, although the latitude and absolute elevation remain nearly the same. Thus the upper limit of British plants will include, unless otherwise qualified, the three conditions of more northern latitude, increased elevation and greater proximity to mountain tracts. Again, by the lower limits are to be understood " the opposite conditions of southern latitude, diminished elevation, and also comparative remoteness from the mountain tracts, as centres around which the species are distributed."

These explanations being kept in view, it will be seen to be impossible at present to represent on maps the distribution of British plants with anything like accuracy, " in consequence of the upper limits of most of the species being yet so little known." Their upper limits in latitude might be traced pretty accurately ; and an approximation to their altitude above the sea-level might be arrived at; but the difficulty would be to determine their propinquity to the mountain centres. This can only be ascertained when botanists shall carefully record the places where plants of the plains are last seen by them, as they enter amongst the valleys of the mountain districts.

> "As an example of such difficulties, let us take Scolopendrium vulgare, a fern widely diffused in Britain from Orkney to the Isle of Wight, and abundant in the south of England. Betwixt these extreme points, however, there are many wide spaces

from which this fern is wholly absent; and one of these spaces perhaps includes nearly the whole of the Highlands. The Scolopendrium is reported to grow in the counties of Renfrew, Lanark, Edinburgh, Forfar, Nairn and Orkney, and thus seems partially to encircle the Highlands. But whether its extreme stations, or upper limits towards the mountain centres, are found in these counties, remains to be shown. Again, Pteris aquilina is exceedingly plentiful in Britain, from one extremity to the other, but it fails upon the higher hills of Wales, the north of England, and the Scottish Highlands; and may even prove to be wholly absent from a transverse belt of high moors and hills crossing Scotland about the 57th parallel of latitude. But what botanist can trace on a map of Britain those portions of the surface from which this very conspicuous fern is quite absent?"—p. 103.

* * * *

"In returning from this digression respecting maps to the immediate subject of the present paper, it may be farther observed, that ferns, as a class of plants, cannot be exclusively connected with any particular local situation or quality of soil. For the most part, a shady situation, damp ground and atmosphere, and a porous or peaty soil, are suitable to ferns; whilst exposure to sun, wind, and salt spray, as well as very dry or marshy localities, are unsuitable. But some of the Asplenia grow in dry crevices of rocks and walls, as also do Grammitis Ceterach, Polypodium Dryopteris, and Polypodium calcareum, and even the less rigid ferns constituting the genus Cistopteris. On the contrary, Osmunda regalis might almost be designated a marsh fern; and other species so far approximate to the same character, as to thrive in swampy ground, that is, in watery places, where the soil is loose and spongy; for example, Aspidium Thelypteris. But ferns that grow well in swampy places will also grow well on rocks and banks where the soil is not particularly wet; for instance, Blechnum boreale and Asplenium Filix-fœmina. None are aquatics. One only is a littoral species, Asplenium marinum; and this one is occasionally seen in places many miles from the sea. Osmunda regalis so frequently occurs near the shore, within reach of the salt spray, and even at times within reach of high tides, that it might be regarded as a sub-littoral species. None perhaps require the sun's rays directly shining upon them; but some few will bear daily exposure to the sun for several hours, though the greater number thrive best on a slender allowance of sunshine. It cannot yet be stated that any species are absolutely limited to soils of a particular chemical or geognostic character; but Grammitis Ceterach, Polypodium calcareum, and the species of Cistopteris, certainly affect lime rocks, though, indeed, it is believed by some botanists, that the Polypodium calcareum is a variety of P. Dryopteris, varied in its habit through the influence of soil or exposure. If so, the only species that is limited to limestone, if even it be so limited, is Grammitis Ceterach. The harder kinds of trap and slate rocks seem favourable to Asplenium septentrionale and Woodsia ilvensis.—And, in general, the sand-stones are more productive of ferns than chalk or clays; though the difference here is probably owing more to the mechanical than to the chemical qualities of the soils."—p. 105.

(To be continued).

## Art. XC.— *Varieties.*

216. *Additions to the Rarer Plants observed at Nottingham*, (Phytol. 78). I send a list of some of the rarer plants which I gathered near Nottingham during a short stay last month.

Salvia Verbenaca. Castle-rock
Lemna polyrhiza. Pools in Nottingham meadows
—— gibba. Near the rocks in the park
Crocus vernus, (in seed). Nottingham meadows
Sclerochloa distans. Ditto
—— rigida. Colwick park-wall
Potamogeton pectinatus and perfoliatus. Canal near Lenton.
Echium vulgare. Castle-rock, &c.
Cynoglossum officinale. Rocks in Colwick park
Lysimachia Nummularia. Nottingham meadows
Hottonia palustris. Ditto
Menyanthes trifoliata. Oxton bog
Rhamnus catharticus. Near Wilford, Colwick Wood, &c.
Smyrnium Olusatrum. Castle rock
Petroselinum sativum. Rocks in Nottingham park
Ulmus suberosa. Near Beeston, &c.
Allium vineale. Rocks at Snenton, castle-rock &c.
Vaccinium Oxycoccos. Oxton bog.
Daphne Laureola. Colwick wood
Butomus umbellatus. Frequent in the Trent vale
Stellaria glauca. Nottingham meadows, and under the gypsum rock at Clifton
Sedum anglicum. Castle rock
Cerastium arvense. Nottingham forest, and banks of the Trent above Wilford
Spiræa Filipendula. Meadows nr. Beeston
Rubus Koehleri. Mapperly plains, &c.
—— Idæus. Colwick wood, &c.
Tilia parvifolia. Mapperly hills
Nuphar lutea. Pools in the meadows
Hesperis matronalis. Rocks in Colwick park
Astragalus glycyphyllos. Ditto
Trifolium subterraneum. Nottingham prk.
—— striatum. Ditto, and near Wilford ferry
Lactuca virosa. Rocks in Colwick park
Carex stellulata. Oxton bog
—— remota and vulpina. Near Beeston
—— divulsa. Near Oxton, and in Colwick park
—— muricata. Nottingham park, &c.
—— stricta. Banks of the Trent, &c.
—— Œderi & ampullacea. Oxton bog
—— vesicaria. Banks of the Trent
—— riparia. Banks of the canal near Lenton, &c.
Quercus intermedia. Colwick wood
Salix Helix. Near Wilford, &c.
—— pentandra. Near Oxton
—— Russelliana. Nottingham meadows
—— alba. Banks of the Trent, &c.
—— acuminata. Oxton bog
—— aurita. Nottingham forest, &c.
—— cinerea. Near Wilford, &c.
—— oleifolia. Colwick wood.

—*Joseph Sidebotham ; 26, York St., Manchester, July* 7, 1842.

217. *Note on Linaria spuria and L. Elatine.* Having lately gathered some very luxuriant plants of Linaria spuria, which grew in abundance with L. Elatine, I was induced to try if I could find any character whereby to distinguish them without taking into consideration the leaves and spur ; and my specimens present the following apparently constant distinctions.

*L. spuria.* Peduncles closely downy: calyx-segments ovate, longer than the capsule.

*L. Elatine.* Peduncles glabrous: calyx-segments ovate, acuminate, with a diaphanous margin reaching half way up, calyx as long as the capsule. — *Wm. Mitten ; 91, Blackman St., Boro', August* 17, 1842.

218. *New Locality for Halimus pedunculatus.*—I have much pleasure in sending you what is, I believe, an unrecorded station for the rare Halimus pedunculatus. I found it in August last, growing not very plentifully in the salt marsh about two miles below Gravesend.—*Id.; September* 17, 1842.

219. *Additional Manchester Plants.* Allow me to make the following additions to the list of Manchester plants, (Phytol. 279).

Avena fatua
Ballota ruderalis
Callitriche pedunculata, *β. sessilis*, (Bab.)
Camelina sativa
Carex angustifolia, (Sm.)
—— ampullacea, var. *longicarpa*, (mihi). This plant is found at Hale Moss; it differs from the common state of the plant, in its fruit being much longer in proportion to its breadth.
—— teretiuscula. Two varieties; one with its fruit as figured in Leighton's Flora, the other with its fruit agreeing with Leighton's figure of the fruit of C. paniculata.
Digitaria sanguinalis. Heap bridge, near Bury
Doronicum Pardalianches. Near Littleborough
Hieracium boreale
Potamogeton oblongus
Reseda alba

Of Scleranthus I have two very different forms from the neighbourhood of Manchester, neither of them will be S. perennis, but as I have no wish at present to speak on their specific identity, but merely to call the attention of botanists to the capsules of the plants belonging to this genus, perhaps some of us will be able to make out the number of seeds contained in each. Lightfoot says "Sem. 2, calyce inclusa, ('Flora Scotica,' 225); Withering says, "Seed single, egg-shaped, inclosed by the gristly tube of the cup," ('Systematic Arrangement of British Plants,' 5th edition, vol. i. p. 240); Smith says "Seeds 2, convex at one side, flat on the other," ('English Flora,' 282); Hooker says "Capsule one-seeded, covered by the calyx," ('British Flora,' 1st ed. 188). —*Samuel Gibson; Hebden Bridge, September* 5, 1842.

220. *Anagallis arvensis with White Flowers.* In the course of one of my rambles this month, I gathered a specimen of Anagallis arvensis, answering precisely to that described by Sir W. Hooker, viz., the "flowers pure white, with a small, well-defined, bright purplish-pink eye in the centre of every corolla," said to have been found by Mr. John Dillwyn, at Penllegare, S. Wales. I could find but one plant, but I shall examine the field carefully next year, and earlier in the season, as my specimen had only two flowers on it, the rest having formed capsules. I should imagine that the specimen gathered by Mr. Dillwyn is the only one upon record.—*Henry Lascelles Jenner; Chiselhurst, Kent, September* 19, 1842.

221. *Botanical chair at King's College.* We are pleased to see the name of Mr. E. Forbes advertized for the summer course on Botany.—*Ed.*

## ART. XCI.—*Proceedings of Societies.*

### BOTANICAL SOCIETY OF LONDON.

*September* 3, 1842.—John Reynolds, Esq., Treasurer, in the chair The following donations were announced:—British plants from the President, from Mr. B. D. Wardale, Mr. G. W. Francis, the Rev. T. Butler and Mr. T. Sansom. Mr. B. D. Wardale presented numerous specimens of *Lastræa cristata* (Presl), collected at Bawsey Bottom, near Lynn, Norfolk. Donations to the Library were announced from the American Academy of Sciences, Philadelphia, the Egyptian Society, Mr. G. W. Francis and Mr. S. P. Woodward.

Mr. Thomas Twining, jun., exhibited a large collection of cultivated specimens from Twickenham. A paper was read from Mr. R. S. Hill, being "An Enquiry into Vegetable Morphology."

Morphology is that division of Botany which takes cognizance of the various changes which occur in the condition of the vegetable organs, both such as are normal, as the transmutation of leaves into the several floral organs, as well as such as are abnormal, and occur only accidentally.

Taking the above as the definition of the subject, we immediately see its divisibility into two heads; the first of which treats of regular metamorphoses, which are connected with the natural structure of all vegetables: while the second includes those irregular or accidental metamorphoses, which result from an imperfect or redundant performance of the several changes noticed under the first head. These last influence particular plants, or parts of plants, and occur only in occasional instances. To this division belongs the consideration of double and other monstrous flowers.

*Of regular Metamorphosis.*—The great principle of regular Morphology is, that the various floral organs are but modifications of one common type, which is the leaf.

Lindley endeavours to give to Linnæus the credit of having been the author, or at least of having suggested the idea of this great fundamental principle; and in proof of this opinion quotes passages from his 'Systema Naturæ' and 'Prolepsis Plantarum,' in which the theory is imperfectly hinted at. At his suggestion the subject does not seem to have been taken up; nor was it at all until Goëthe published in 1770 his work 'On Vegetable Metamorphosis.' With a knowledge of the character of his poetical writings, it hardly need excite surprise that botanists of the day should have been sceptical on a subject so new, and at first sight so opposed to the dictates of common sense; and that his work at the time should have been considered to partake of the fanciful character of his poetry; or that they should regard it more as a poetical dream than as a sober philosophical truth, in connexion with a natural science.

Leaves are in many instances entirely wanting, or exist only in the degenerated forms of scales and spines. In these cases there is hardly any part of a plant which is not capable of being modified and rendered capable of performing the functions of leaves. For this purpose we find the excessive development of the stem which obtains throughout lactaceous plants; also the stem is furnished with leafy wings or expansions which run down its sides, as is seen in *Acacia alata*, &c. The petiole, in the form of the phyllodium, frequently takes upon itself the office of the leaf, as in most of the Acacias from New Holland. The same functions are frequently discharged by the peduncle, as in *Ruscus*, *Asparagus*, &c.; and this appears to be the true character of the leafy organs of Ferns, the true leaves of which exist in the degenerated form of scales known by the name of ramenta.

The evidence of the identity of bracteæ with leaves is more apparent than that of many of the other organs, for in very many plants they differ but little, except in size, from the original type, and indeed in almost every instance, even among those which are highly coloured, as in many of the genus *Salvia*, we find presented a gradual transition from the form and colour of the leaf to an almost petaloid condition; *Salvia splendens* and *Sclarea* are both good examples of this. The position of these organs on the axis shows clearly their close analogy to leaves, for they usually follow more or less the normal position of the leaves of the species, whether alternate or opposite. The calyx consists of a series of leaves arranged in a whorled manner round the axis, either distinct, or more or less combined, according to the character of the plant under consideration. Examples of partial reversion of calyx to the character of the leaf are seen in specimens of *Trifolium repens*, the *Polyanthus* of the gardens, and in cultivated roses.

In monstrous specimens we sometimes meet with the petals becoming leafy, of the occurrence of which in *Anemone nemorosa* M. DeCandolle has represented a remarkable example; and the author had seen the same condition occurring in the petals of *Papaver Argemone*.

Stamens appear to be formed from petals by the gradual narrowing of their lower part, so as to form the filament, while the anthers develope themselves on the upper margins. *Nympeæa alba* affords a beautiful example of the gradual transition of all the floral organs; and in it this transmutation of petals into stamens is clearly seen, the petals at first become narrower, then one of the margins has an abortive anther developed on it, to this another is afterwards added on the opposite margin, and finally the contraction of the petal having completely taken place, a perfect stamen is developed.

The petaloid cup which is found in the genus *Narcissus* is formed from an additional row of three stamens, as is evident from the frequent division of this organ into three pieces, which alternate with the divisions of the corolla.

The only instance with which the author was acquainted, wherein the carpellary leaf is to be found in an extended or unfolded state, naturally occurs in the order Coniferæ, where it simply covers but does not enclose the ovules. The carpellary leaf in this condition manifestly approaches a bractea.

The conversion of the pistil into a leaf is likewise frequently seen in *Trifolium repens;* and the author has a specimen of a species of *Potentilla*, which exhibits this change in a remarkable degree.

It was announced that the paper would be continued at the next meeting.

Mr. Adam White laid before the Society a selection of the plants he had lately found in a walk from Whiting Bay, Isle of Arran, to Brodick, and from Brodick to the top of Goatfell. He alluded to the strangely contrasted climates of Arran, arising partly from its insular position and its alpine mountains; he exhibited a few lichens, mosses, and phænogamic plants peculiar to alpine districts, and at the same time from the garden of Mr. Paterson of Whitehouse, Lamlash, laid before the meeting dried specimens of two species of *Leptospermum* from New Holland, one of them believed to be new, as well as of three or four other New Holland plants, the names of which were as yet unascertained. He particularly referred to the fine plants of warmer regions reared by Mr. Paterson in the open air, some of which stand the winter without shelter; as instances he referred to two species of *Salvia*, *Pentstemon*, &c., and exhibited luxuriant sprigs of Fuschsias, one of which was taken from a tree-like shrub, 18 feet high, and 22 feet wide, which, in its native soil, could scarcely have been more luxuriant. The damp atmosphere, he remarked, so different to their own dry climate, prevented some of the New Holland plants from flowering, but, he added, their luxuriant foliage and strong shoots nearly compensated for this. He alluded to the lists of the rarer plants found in the island, and communicated by the Rev. David Landsborough to Dr. M'Naughton, for insertion in his account of Kilbride (one of the island parishes) published in the 'New Statistical Account of Scotland,' and mentioned that he had been lately informed that Professor Gardner of Glasgow, in company with the minister of Stevenston, had found *Funaria Muhlenbergii*, a rather scarce moss, in tolerable plenty.—*G.E.D.*